Not only is much of the region of the middle and lower reaches of the Yangtze River characterized by steep hills but also it contains the densest population and most economically developed area in China. Due to intense impact of human activities, forest resources have suffered serious damage, resulting in a low quality of forest, made up of a few types of plantation forest with simple structure and low capacity for water and soil loss control. In addition, due to the steep gradients of the hills, high susceptibility indices of soil erodibility, and plentiful rainfall of non-uniform distribution, intense water and soil loss, as well as landslides, occurs frequently. These geomorphologic and natural environmental characteristics determine that for the currently bare lands, steep hillslopes currently under cultivation, and the lands that have undergone desertification, reforestation is the only choice for achieving regional sustainable development and the realization of a harmonious relationship between man and nature.

Up until recently, research on forestry ecological engineering for water and soil loss control has made great progress on small areas or on single forest communities, but there is still a lack of synthetic research and model demonstration at the catchment scale. Because of the long timescales in forest development, the theory and methods of reforestation were mostly reached by means of substituting space for time in basic research, so it was technically difficult to make comparisons across space. More recently, researchers have performed blocks of experiments and demonstrations of reforestation in the provinces of Jiangxi, Anhui, Jiangsu, Zhejiang, etc., and acquired much support from Chinese national research projects over a period of 20 years and achieved much success. Based on the past research results and monitoring data over this long period, this book first presents the several proposed soil loss prediction models.

For soil loss control in the mountains of China, the first step is the determination of appropriate strategies. There is an urgent need for soil loss models that can provide sufficient information for making strategies to control soil loss using field observation data taken over short periods, such as several years. The USLE (universal soil loss equation) models were developed in the USA in the 1960s and applied for average annual soil loss prediction widely in the world. But their application requires observational data over many years. In addition, the USLE models
do not take much account of the typical operations of human beings that are usual in China’s cultivated lands. With the development of economy, controlling the environmental problems has become so important that more information should be provided for making soil loss control strategies based on field observation data over just a few years. Furthermore, soil loss control needs the cooperation of farmers and local residents. Effective soil loss models facilitate the communication between environmental experts and farmers and citizens.

This research also proposed a systematic application of the GOIUG (GIS-based observed instantaneous unit graph) model, integrated to make graphical predictions of instantaneous suspended sediment discharge with GIS, the IUG method, and a hydrologic model, which is used to simulate the suspended sediment generation and its transmission to the outlet. It helps to elucidate, quantitatively, the source of sediment discharge. Furthermore, a model of ER (effective rainfall erosivity)-USLE was developed from USLE to predict annual soil loss based on single events with an effective rain erosivity factor. The model portrays the interactions among seasonal precipitation, seasonal crop coverage, and individual operations by human beings ($P_s$). The litter factor is incorporated into USLE in order to create a FUSLE model for application in forests. These models are believed applicable with higher accuracy in China and suitable for strategy making in soil loss control in the cultivated land and forest management.

Second, this work developed many types of reforestation, especially some key techniques, such as secondary forest culture with a focused tree plantation method, agriculture–forestry methods in the hills, reforestation in extremely eroded areas of red soil, and forest soil fertility protection. These methods are providing technical support for nationally important projects, such as the Chinese natural forest protection, reforestation in cultivated land at slopes above 25°, and wood forestation forest construction in southern China.

In particular, techniques of reforestation also focused on improving the living standards of farmers, proposing a “small recycling” system made up of tree, crop–feeding–biogas–fertility–fishing, etc and a “big recycling” system made up of interaction between the countryside of mountainous areas and the urban areas in the lower elevations. The “small recycling” can not only make money for the farmers effectively, while keeping the environment clean from being polluted by animal excrement, but also save fuel materials such as twigs and litter of tree, and shrub and grass from being collected, thus protecting the reforested young trees from harm. The “big recycling” makes a harmonious society, with the aim of common health and wealth.

We have a long cooperation in eco-restoration with world famous ecologist, Professor Donald DeAngelis. During his recent visit in China, he was very pleased with the rapidly increasing forest coverage in south China. He thought the fast reforestation method may not only be useful in China but also provide a good model to eliminate poverty for the poor farmers in the other undeveloped countries all over the world. In addition, effective reforestation will enhance the effort to slow world
climate warming. Then we discussed the possibility of compiling a book on reforestation techniques and soil loss control theory for the purpose of providing useful assistance to researchers, university graduates, and foresters. Both of us believed that it was the right time to compile a book integrating our common research progress and assessment on reforestation and soil loss control in eastern China.

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